

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 22 August 2001 (22.08.01)	
International application No. PCT/US00/27043	Applicant's or agent's file reference 39373P/G602
International filing date (day/month/year) 29 September 2000 (29.09.00)	Priority date (day/month/year) 29 September 1999 (29.09.99)
Applicant BOLDING, Vance, E. et al	

1. The designated Office is hereby notified of its election made:



in the demand filed with the International Preliminary Examining Authority on:

26 April 2001 (26.04.01)



in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Zakaria EL KHODARY
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: HAYDEN A. CARNEY
CHRISTIE, PARKER & HALE, LLP
POST OFFICE BOX 7068
PASADENA, CA 91109-7068

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference 39373P/G602	Date of Mailing (day/month/year) 17 JAN 2001
International application No. PCT/US00/27043	International filing date (day/month/year) 29 SEPTEMBER 2000
Applicant GLOBAL MARINE INC.	

1. ☒ The applicant is hereby notified that the international search report has been established and is transmitted herewith.
Filing of amendments and statement under Article 19:
 The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the international search report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO
 34, chemin des Colombettes
 1211 Geneva 20, Switzerland
 Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.
2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.
3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.
4. **Further action(s):** The applicant is reminded of the following:
 Shortly after **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in rules 90 *bis* 1 and 90 *bis* 3, respectively, before the completion of the technical preparations for international publication.
 Within **19 months** from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).
 Within **20 months** from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer JANICE L. KRIZEK <i>Diane Smith for</i> Telephone No. (703) 308-2026
---	---

PATENT COOPERATION TREATY

**HAC
RECEIVED**

JUL 31 2001

Christie, Parker & Hale, LLP

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To: HAYDEN A. CARNEY
CHRISTIE, PARKER & HALE, LLP
POST OFFICE BOX 7068
PASADENA, CA 91109-7068

PCT

NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

CASE # 39373 PCT ACTION

REMINDER _____ DUE DATE _____

DEADLINE _____

Date of Mailing
(day/month/year)

26 JUL 2001

Applicant's or agent's file ref. no.

39373P/G602

IMPORTANT NOTIFICATION

International application No.

PCT/US00/27043

International

date (day/month/year)

29 SEPTEMBER 2000

Priority Date (day/month/year)

29 SEPTEMBER 1999

Applicant

GLOBAL MARINE INC.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

JANICE L. KRIZEK

Diane Smith

Telephone No. (703) 308-2026

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To: HAYDEN A. CARNEY
CHRISTIE, PARKER & HALE, LLP
POST OFFICE BOX 7068
PASADENA, CA 91109-7068

PCT

NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of Mailing
(day/month/year) **26 JUL 2001**

Applicant's or agent's file reference
39373P/G602

IMPORTANT NOTIFICATION

International application No.
PCT/US00/27043

International filing date (day/month/year)
29 SEPTEMBER 2000

Priority Date (day/month/year)
29 SEPTEMBER 1999

Applicant
GLOBAL MARINE INC.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

JANICE L. KRIZEK

Diane Smith f

Telephone No. (703) 308-2026

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 39373P/G602	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/US00/27043	International filing date (day/month/year) 29 SEPTEMBER 2000	(Earliest) Priority Date (day/month/year) 29 SEPTEMBER 1999
Applicant GLOBAL MARINE INC.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (See Box II).

4. With regard to the title, /

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract, /

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No. 5

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/27043**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) :E21B 19/09, 19/15

US CL :211/70.4; 414/22.54,22.57,22.59, 22.62

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 211/70.4; 414/22.54,22.57,22.59, 22.62

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3,145,786 A (O'NEILL et al) 25 August 1964 (25/08/64).	
A	US 3,612,286 A (LANGOWSKI et al) 12 October 1971 (12/10/71).	
A	US 3,616,941 A (WALLING) 02 November 1971 (02/11/71).	
A	US 3,844,420 A (WALLING et al) 29 October 1974 (29/10/74).	
A	US 3,870,165 A (BESIEN) 11 March 1975 (11/03/75).	

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

12 DECEMBER 2000

Date of mailing of the international search report

17 JAN 2001

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

JANICE L. KRIZEK

Telephone No. (703) 308-2026

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US00/27043

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3,978,994 A (WOOLSLAYER et al) 07 September 1976 (07/09/76), see entire document.	1-4, 16, 42-44, 49
A	US 4,439,091 A (FRIAS) 27 March 1984 (27/03/84).	

PCT

REC'D 31 JUL 2001

WIPO

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 39373P/G602	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US00/27043	International filing date (day/month/year) 29 SEPTEMBER 2000	Priority date (day/month/year) 29 SEPTEMBER 1999
International Patent Classification (IPC) or national classification and IPC IPC(7): E21B 19/09, 19/15 and US Cl.: 211/70.4; 414/22.54, 22.57, 22.59, 22.62		
Applicant GLOBAL MARINE INC.		

<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>3</u> sheets.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of <u>5</u> sheets.</p>
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of report with regard to novelty, inventive step or industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability: citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>

Date of submission of the demand 26 APRIL 2001	Date of completion of this report 22 JUNE 2001
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer JANICE L. KRIZEK <i>Diane Smith</i>
Facsimile No. (703) 305-3230	Telephone No. (703) 308-2026

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/27043

I. Basis of the report

1. With regard to the elements of the international application:*

☐ the international application as originally filed☒ the description:

pages 1-27, as originally filed
pages NONE, filed with the demand
pages NONE, filed with the letter of

☒ the claims:

pages NONE, as originally filed
pages NONE, as amended (together with any statement) under Article 19
pages 28-35, filed with the demand
pages NONE, filed with the letter of

☒ the drawings:

pages 1-20, as originally filed
pages NONE, filed with the demand
pages NONE, filed with the letter of

☒ the sequence listing part of the description:

pages NONE, as originally filed
pages NONE, filed with the demand
pages NONE, filed with the letter of

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).☐ the language of publication of the international application (under Rule 48.3(b)).☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in printed form.☐ filed together with the international application in computer readable form.☐ furnished subsequently to this Authority in written form.☐ furnished subsequently to this Authority in computer readable form.☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.4. ☒ The amendments have resulted in the cancellation of:☒ the description, pages NONE☒ the claims, Nos. NONE☒ the drawings, sheets/fig. NONE5. ☐ This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

**Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/27043

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. statement**

Novelty (N)

Claims 1-53 YESClaims NONE NO

Inventive Step (IS)

Claims 1-53 YESClaims NONE NO

Industrial Applicability (IA)

Claims 1-53 YESClaims NONE NO**2. citations and explanations (Rule 70.7)**

Claims 1-53 meet the criteria of PCT Articles 33(2)-33(4) because the apparatus for and methods of handling drill pipe are not taught nor fairly suggested by the prior art or any combination thereof.

----- NEW CITATIONS -----

NONE

1 CLAIMS

1. A drill pipe storage apparatus comprising:
a pipe storage bin,
5 horizontal pipe support members disposable in the bin at plural spaced stations along the length of the bin for individually supporting plural horizontal lengths of drill pipe in an array of plural vertically spaced layers and of plural lengths of drill pipe in each layer, and
selectively operable drive mechanisms connected to the pipe support members and
operable to move the members individually between deployed positions in which the support
10 members are in the array and horizontal retracted positions in which the support members are removed from the array.

2. Apparatus according to claim 1 in which the pipe support members are arranged
15 to support the pipe lengths without subjecting any pipe length to loads due to pipe and support members thereabove in the array.

3. Apparatus according to claim 1 in which the lowermost support member at each
station as carried on a bin base, and each other support member at the station when disposed in
the array is engaged with and supported on the support member below it.
20

4. Apparatus according to claim 3 in which the pipe support members when engaged
with each other are keyed against relative movement in directions along pipe lengths supported
in the bin.

5. A drill pipe storage apparatus comprising:
a pipe storage bin,
horizontal pipe support members disposable in the bin at plural spaced stations
along the length of the bin for individually supporting plural horizontal lengths of drill pipe in
an array of plural vertically spaced layers and of plural lengths of drill pipe in each layer, the
30 lowermost support member at each station being carried on a bin base, and each other support member at the station when disposed in the array being engaged with and supported on the support member below it, each pipe support member defining in an upper part thereof a plurality of upwardly open notches sized in cooperation with the vertically adjacent contour of the support member thereabove in the array to receive in each notch a respective pipe length of selected
35 diameter without contact of the pipe length with the support member directly thereabove, and
selectively operable drive mechanisms connected to the pipe support members and
operable to move the members individually between deployed positions in which the support

1 members are in the array and retracted positions in which the support members are removed from
the array.

5 6. Apparatus according to claim 5 in which the pipe receiving notches have
substantially straight sloping sides.

7. A drill pipe storage apparatus comprising:
a pipe storage bin,
horizontal pipe support members disposable in the bin at plural spaced stations
10 along the length of the bin for individually supporting plural horizontal lengths of drill pipe in
an array of plural vertically spaced layers and of plural lengths of drill pipe in each layer, and
selectively operable drive mechanisms connected to the pipe support members and
operable to turn the support members about vertical axes located outside the array to move the
members individually between deployed positions in which the support members are in the array
15 and retracted positions in which the support members are removed from the array.

8. Apparatus according to claim 7 in which the drive mechanisms are operable to lift
and lower the pipe support members.

20 9. Apparatus according to claim 7 in which the drive mechanisms include at each
station a rotatable vertical shaft with which is associated a group of pipe support members, each
support member in the group having an end frame through which the shaft rotatably passes, a
coupling selectively engageable between each pipe support member and the shaft for securing
the shaft from rotation relative to the pipe support member, and a shaft drive operable for rotating
25 the shaft a selected amount in either direction about its axis.

30 10. Apparatus according to claim 9 in which the shaft is axially movable through each
pipe support member, each coupling is operable for securing the associated pipe support member
from axial motion of the shaft relative thereto, and the shaft drive is operable for raising and
lowering the shaft a selected amount.

11. Apparatus according to claim 9 including a holder for each support member with
which the support member is engageable in its retracted position.

35 12. Apparatus according to claim 9 in which the pipe support members at each station
comprises two groups of movable support members, alternate support members being members
of a respective group with which is associated a respective one of a pair of vertical shafts.

1 13. Apparatus according to claim 12 in which the shafts at each station are disposed
at a common side of the bin.

5 14. Apparatus according to claim 12 in which the pipe support members in one group
have retracted positions in which they extend in one direction from the station substantially
parallel to the array, and retracted pipe support members in the other group extend in an opposite
direction from the station substantially parallel to the array.

10 15. Apparatus according to claim 12 in which the deployed positions of the pipe
support members at each station are in a common vertical plane disposed transversely of the
array, and each support member above the lowermost one is supportively engaged with the
support members below it.

15 16. A drill pipe storage apparatus comprising:
a pipe storage bin stationary relative to a place of pipe use
horizontal pipe support members disposable in the bin at plural spaced stations
along the length of the bin for individually supporting plural horizontal lengths of drill pipe in
an array of plural vertically spaced layers and of plural lengths of drill pipe in each layer,
selectively operable drive mechanisms connected to the pipe support members and
20 operable to move the members individually between deployed positions in which the support
members are in the array and retracted positions in which the support members are removed from
the array, and a pipe lifter disposable above the array and operable to move individual pipe
lengths in a horizontal attitude between the array and a transfer position laterally of the array.

25 17. Apparatus according to claim 16 in which the pipe lifter comprises a bridge crane
spanning the length of the bin and movable transversely relative to the bin.

30 18. Apparatus according to claim 16 in which the pipe lifter includes a plurality of
controllable magnetic pipe lift units engageable with a pipe length at spaced locations along the
length.

 19. Apparatus according to claim 18 in which each pipe lift unit comprises plural
permanent magnets and a selectively operable degausser.

35 20. Apparatus according to claim 18 in which each pipe lift unit includes a backup
mechanical holder selectively engageable with and releasable from a pipe length.

1 21. Apparatus according to claim 18 in which the pipe lift units are supported on a common carrier.

5 22. Apparatus according to claim 21 in which the bridge crane has a stowed position spaced laterally from the bin in which pipe lift units are securable to structures at a lower exterior portion of the bin.

10 23. Apparatus according to claim 21 in which the common carrier for the pipe lift units is movable vertically relative to the bridge crane via a plurality of column members drivable vertically of the crane.

15 24. Apparatus according to claim 23 in which the column members have vertically spaced guides in the bridge crane arranged to constrain the column members to motion substantially only normal relative to the crane.

20 25. Apparatus according to claim 16 in which the bin is spaced in a direction substantially parallel to the length of the bin from a place of use of pipe lengths, and including a pipe delivery mechanism for moving pipe in a horizontal attitude between a transfer position adjacent the bin and the place of pipe use, the pipe delivery mechanism includes a track extending from the transfer position toward the place of pipe use.

25 26. Apparatus according to claim 25 including an elongate carriage drivable in each of two opposite directions along the track to and from the transfer position, the carriage having a length adequate to support a pipe length in alignment therewith at one end of the pipe length and at a location along the pipe length near its other end.

30 27. Apparatus according to claim 26 including a cart drivable in each of two opposite directions along the length of the carriage, the cart defining an upwardly open receptacle for receiving and bearing the one end of a pipe length supported on the carriage.

28. Apparatus according to claim 27 including a pipe support roller mounted at the end of the carriage nearest the place of pipe use for rotation about a horizontal axis.

35 29. Apparatus according to claim 28 in which the roller has a larger diameter in its ends than between its ends.

1 30. Apparatus according to claim 28 including a selectively operable lift mechanism mounted between the roller and the carriage operable for controllably raising and lowering the roller relative to the carriage.

5 31. Apparatus according to claim 30 in which the roller lift mechanism is disposed on the carriage out of the path of the cart along the carriage.

 32. Apparatus according to any one of claims 25-31 in which the place of pipe use is a well drilling facility which includes a drilling operations platform.

10 33. Apparatus according to claim 32 in which the track is substantially coplanar with the drilling operations platform.

15 34. Apparatus according to claim 32 in which the drilling facility is located on a floatable offshore drilling structure.

 35. Apparatus according to claim 34 including a second pipe storage bin disposed in proximate parallel relation to the transfer position.

20 36. A drill pipe storage and handling apparatus for a well drilling rig comprising:
 a track extending from one end adjacent the drilling rig to an opposite end remote from the rig,

 an elongate carriage adapted to travel along the track and to receive a length of drill pipe disposed longitudinally with respect to the track and to support a received pipe length at spaced locations therealong,

25 a pipe storage bin disposed laterally of one end of the track including horizontal pipe support members cooperatively configured for individually supporting plural lengths of drill pipe in an array of plural vertically spaced layers of pipe and plural length of pipe in each layer, the pipe support members above the bottom layer being indexable between deployed positions in and transversely of the array and retracted positions outside the array,

30 a moveable pipe lifter disposable above the bin operable to move individual pipe lengths between the array and the carriage.

 37. Apparatus according to claim 36 in which the carriage includes a pipe lifter at its end adjacent the drilling rig operable to lift the adjacent end of a received pipe length a selected distance above the carriage.

1 38. Apparatus according to claim 37 in which each pipe length has a pin end and a box end, the pipe lengths are disposed in the array with their pin ends remote from the drilling rig, and including a cart movable along the carriage adapted for supporting the pin end of a received pipe length.

5 39. Apparatus according to claim 38 in which the carriage is drivable along the track, and the cart is drivable along the carriage.

10 40. Apparatus according to claim 36 in which the track and the carriage are common to and are disposed between a pair of similar bins.

 41. Apparatus according to claim 40 in which the pipe lifter is operable to move pipe lengths between either bin and the carriage.

15 42. A method of storing oil and gas well drill pipe comprising the steps of horizontally disposing a selected number of pipe lengths, as a first bottom layer thereof, individually in upwardly open notches in the upper extents of a set of stationary pipe supports disposed transversely of the pipe lengths at stations spaced along the lengths, and horizontally disposing further numbers of pipe lengths in further similarly notched pipe support sets placed at each station atop the supports therebelow to create a stationary array of plural layers of plural numbers of pipe lengths, and raising and lowering individual pipe lengths directly from above and to receiving notches in the pipe supports.

20 43. The method according to claim 42 including defining the support members so that each pipe length in the array makes contact only with the surfaces of the upwardly open notches of the pipe supports immediately below it in the array.

25 44. The method according to claim 42 including the further step of moving each set of pipe supports to retracted horizontal positions out of the array upon removal of all pipe lengths from the layer supported by that set to expose the next lower layer in the array, and moving the next upper set of supports into deployed positions in the array on filling a pipe length layer in the array.

30 45. The method according to claim 44 in which moving the pipe supports from deployed positions to retracted positions includes raising the deployed supports out of contact with the supports therebelow in the array, swinging each raised support horizontally about an axis at an end of the support, and lowering the raised and swung supports into holders therefor located outside the array.

1 46. The method according to claim 45 in which moving the pipe supports from retracted positions to deployed positions includes performing the reverse of each of the operations described in claim 45 in reverse sequence.

5 47. The method according to claim 42 in which raising individual pipe lengths from the pipe supports includes engaging a pipe length from above at spaced locations along the length by a plurality of magnetic lift heads, and raising the lift heads in substantial unison.

10 48. The method according to claim 42 in which lowering individual pipe lengths to the pipe supports includes horizontally supporting a pipe length from above via a plurality of magnetic lift heads at spaced locations along the pipe length, lowering the lift heads in substantial unison to place the pipe length in aligned notches in a set of pipe supports, and nulling the magnetic fields of the lift heads.

15 49. A method of storing oil and gas well drill pipe comprising the steps of horizontally disposing a selected number of pipe lengths, as a first bottom layer thereof, individually in upwardly open notches in the upper extents of a set of pipe supports disposed transversely of the pipe lengths at stations spaced along the lengths, and horizontally disposing further numbers of pipe lengths in further similarly notched pipe support sets placed at each station atop the supports therebelow to create an array of plural layers of plural numbers of pipe lengths, and raising and lowering individual pipe lengths directly from and to receiving notches in the pipe supports, raising a pipe length from its pipe supports including moving the pipe length in a horizontal attitude from the array to a state of support on a carriage movable along a path laterally from, adjacent to and parallel to the array, the carriage supporting the pipe length at spaced locations
20 along the pipe length.
25

30 50. The method according to claim 49 including raising an end one of the locations of carriage support of the pipe relative to the carriage upon movement of the carriage to a selected place displaced from the array, the selected place being associated with removal of the pipe length from the carriage.

35 51. The method according to claim 49 in which the carriage has two locations of support of a pipe length disposed thereon, one of which is raisable relative to the carriage, the other of which is movable along the carriage and is adapted to support an end of the pipe length.

 52. A method for storing, handling, and moving drill pipe in association with a well drilling rig having a drilling operations floor, the method comprising the operations of:

1 lifting a stand of drill pipe directly from an individual horizontal storage position
in an array of stand storage positions,

placing the lifted stand on a carriage arranged to support the placed stand at spaced
locations along its length,

5 moving the carriage towards the floor to place one end of the carriage at the floor,
elevating the one end of the placed stand above its placed position on the carriage
as the carriage nears the floor, and

hoisting the stand via the one end thereof to a vertical position above the floor while
movably supporting the other end of the stand on the carriage.

10 53. The method according to claim 52 in which the elevating operation includes raising
the location of carriage support of the placed stand which is nearest the one end of the stand.

WO 01/23701 A1



IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

— *With international search report.*

1. A drill pipe storage apparatus comprising:
a pipe storage bin,

5 horizontal pipe support members disposable in the bin at plural spaced stations along the length of the bin for individually supporting plural horizontal lengths of drill pipe in an array of plural vertically spaced layers and of plural lengths of drill pipe in each layer, and selectively operable drive mechanisms connected to the pipe support members and operable to move the members individually between deployed positions in which the support
10 members are in the array and retracted positions in which the support members are removed from the array.

2. Apparatus according to claim 1 in which the pipe support members are arranged to support the pipe lengths without subjecting any pipe length to loads due to pipe and support
15 members thereabove in the array.

3. Apparatus according to claim 1 in which the lowermost support member at each station as carried on a bin base, and each other support member at the station when disposed in the array is engaged with and supported on the support member below it.
20

4. Apparatus according to claim 3 in which the pipe support members when engaged with each other are keyed against relative movement in directions along pipe lengths supported in the bin.

5. Apparatus according to claim 3 in which each pipe support member defines in an upper part thereof a plurality of upwardly open notches sized in cooperation with the vertically adjacent contour of the support member thereabove in the array to receive in each notch a respective pipe length of selected diameter without contact of the pipe length with the support member directly thereabove.
30

6. Apparatus according to claim 5 in which the pipe receiving notches have substantially straight sloping sides.

7. Apparatus according to claim 1 in which the pipe support member drive
35 mechanisms are operable to turn the support members about vertical axes located outside the array.

1 8. Apparatus according to claim 7 in which the drive mechanisms are operable to lift
and lower the pipe support members.

5 9. Apparatus according to claim 7 in which the drive mechanisms include at each
station a rotatable vertical shaft with which is associated a group of pipe support members, each
support member in the group having an end frame through which the shaft rotatably passes, a
coupling selectively engageable between each pipe support member and the shaft for securing
the shaft from rotation relative to the pipe support member, and a shaft drive operable for rotating
the shaft a selected amount in either direction about its axis.

10 10. Apparatus according to claim 9 in which the shaft is axially movable through each
pipe support member, each coupling is operable for securing the associated pipe support member
from axial motion of the shaft relative thereto, and the shaft drive is operable for raising and
lowering the shaft a selected amount.

15 11. Apparatus according to claim 9 including a holder for each support member with
which the support member is engageable in its retracted position.

20 12. Apparatus according to claim 9 in which the pipe support members at each station
comprises two groups of movable support members, alternate support members being members
of a respective group with which is associated a respective one of a pair of vertical shafts.

25 13. Apparatus according to claim 12 in which the shafts at each station are disposed
at a common side of the bin.

30 14. Apparatus according to claim 12 in which the pipe support members in one group
have retracted positions in which they extend in one direction from the station substantially
parallel to the array, and retracted pipe support members in the other group extend in an opposite
direction from the station substantially parallel to the array.

35 15. Apparatus according to claim 12 in which the deployed positions of the pipe
support members at each station are in a common vertical plane disposed transversely of the
array, and each support member above the lowermost one is supportively engaged with the
support members below it.

 16. Apparatus according to claim 1 including a pipe lifter disposable above the array
and operable to move individual pipe lengths in a horizontal attitude between the array and a
transfer position laterally of the array.

1 17. Apparatus according to claim 16 in which the pipe lifter comprises a bridge crane spanning the length of the bin and movable transversely relative to the bin.

5 18. Apparatus according to claim 16 in which the pipe lifter includes a plurality of controllable magnetic pipe lift units engageable with a pipe length at spaced locations along the length.

10 19. Apparatus according to claim 18 in which each pipe lift unit comprises plural permanent magnets and a selectively operable degausser.

10 20. Apparatus according to claim 18 in which each pipe lift unit includes a backup mechanical holder selectively engageable with and releasable from a pipe length.

15 21. Apparatus according to claim 18 in which the pipe lift units are supported on a common carrier.

20 22. Apparatus according to claim 21 in which the bridge crane has a stowed position spaced laterally from the bin in which pipe lift units are securable to structures at a lower exterior portion of the bin.

20 23. Apparatus according to claim 21 in which the common carrier for the pipe lift units is movable vertically relative to the bridge crane via a plurality of column members drivable vertically of the crane.

25 24. Apparatus according to claim 23 in which the column members have vertically spaced guides in the bridge crane arranged to constrain the column members to motion substantially only normal relative to the crane.

30 25. Apparatus according to claim 16 in which the bin is spaced in a direction substantially parallel to the length of the bin from a place of use of pipe lengths, and including a pipe delivery mechanism for moving pipe in a horizontal attitude between a transfer position adjacent the bin and the place of pipe use, the pipe delivery mechanism includes a track extending from the transfer position toward the place of pipe use.

35 26. Apparatus according to claim 25 including an elongate carriage drivable in each of two opposite directions along the track to and from the transfer position, the carriage having a length adequate to support a pipe length in alignment therewith at one end of the pipe length and at a location along the pipe length near its other end.

1 27. Apparatus according to claim 26 including a cart drivable in each of two opposite directions along the length of the carriage, the cart defining an upwardly open receptacle for receiving and bearing the one end of a pipe length supported on the carriage.

5 28. Apparatus according to claim 27 including a pipe support roller mounted at the end of the carriage nearest the place of pipe use for rotation about a horizontal axis.

 29. Apparatus according to claim 28 in which the roller has a larger diameter in its ends than between its ends.

10 30. Apparatus according to claim 28 including a selectively operable lift mechanism mounted between the roller and the carriage operable for controllably raising and lowering the roller relative to the carriage.

15 31. Apparatus according to claim 30 in which the roller lift mechanism is disposed on the carriage out of the path of the cart along the carriage.

 32. Apparatus according to any one of claims 25-31 in which the place of pipe use is a well drilling facility which includes a drilling operations platform.

20 33. Apparatus according to claim 32 in which the track is substantially coplanar with the drilling operations platform.

25 34. Apparatus according to claim 32 in which the drilling facility is located on a floatable offshore drilling structure.

 35. Apparatus according to claim 34 including a second pipe storage bin disposed in proximate parallel relation to the transfer position.

30 36. A drill pipe storage and handling apparatus for a well drilling rig comprising:
 a track extending from one end adjacent the drilling rig to an opposite end remote from the rig,

 an elongate carriage adapted to travel along the track and to receive a length of drill pipe disposed longitudinally with respect to the track and to support a received pipe length at spaced locations therealong,

35 a pipe storage bin disposed laterally of one end of the track including horizontal pipe support members cooperatively configured for individually supporting plural lengths of drill pipe in an array of plural vertically spaced layers of pipe and plural length of pipe in each layer,

1 the pipe support members above the bottom layer being indexable between deployed positions
in and transversely of the array and retracted positions outside the array,

a moveable pipe lifter disposable above the bin operable to move individual pipe
lengths between the array and the carriage.

5 37. Apparatus according to claim 36 in which the carriage includes a pipe lifter at its
end adjacent the drilling rig operable to lift the adjacent end of a received pipe length a selected
distance above the carriage.

10 38. Apparatus according to claim 37 in which each pipe length has a pin end and a box
end, the pipe lengths are disposed in the array with their pin ends remote from the drilling rig,
and including a cart movable along the carriage adapted for supporting the pin end of a received
pipe length.

15 39. Apparatus according to claim 38 in which the carriage is drivable along the track,
and the cart is drivable along the carriage.

40. Apparatus according to claim 36 in which the track and the carriage are common
to and are disposed between a pair of similar bins.

20 41. Apparatus according to claim 40 in which the pipe lifter is operable to move pipe
lengths between either bin and the carriage.

25 42. A method of storing oil and gas well drill pipe comprising the steps of horizontally
disposing a selected number of pipe lengths, as a first bottom layer thereof, individually in
upwardly open notches in the upper extents of a set of pipe supports disposed transversely of the
pipe lengths at stations spaced along the lengths, and horizontally disposing further numbers of
pipe lengths in further similarly notched pipe support sets placed at each station atop the supports
therebelow to create an array of plural layers of plural numbers of pipe lengths, and raising and
30 lowering individual pipe lengths directly from and to receiving notches in the pipe supports.

43. The method according to claim 42 including defining the support members so that
each pipe length in the array makes contact only with the surfaces of the upwardly open notches
of the pipe supports immediately below it in the array.

35 44. The method according to claim 42 including the further step of moving each set of
pipe supports to retracted positions out of the array upon removal of all pipe lengths from the

1 layer supported by that set to expose the next lower layer in the array, and moving the next upper
set of supports into deployed positions in the array on filling a pipe length layer in the array.

5 45. The method according to claim 44 in which moving the pipe supports from
deployed positions to retracted positions includes raising the deployed supports out of contact
with the supports therebelow in the array, swinging each raised support horizontally about an axis
at an end of the support, and lowering the raised and swung supports into holders therefor located
outside the array.

10 46. The method according to claim 45 in which moving the pipe supports from
retracted positions to deployed positions includes performing the reverse of each of the
operations described in claim 45 in reverse sequence.

15 47. The method according to claim 42 in which raising individual pipe lengths from
the pipe supports includes engaging a pipe length from above at spaced locations along the length
by a plurality of magnetic lift heads, and raising the lift heads in substantial unison.

20 48. The method according to claim 42 in which lowering individual pipe lengths to the
pipe supports includes horizontally supporting a pipe length from above via a plurality of
magnetic lift heads at spaced locations along the pipe length, lowering the lift heads in substantial
unison to place the pipe length in aligned notches in a set of pipe supports, and nulling the
magnetic fields of the lift heads.

25 49. The method according to claim 42 in which raising a pipe length from its pipe
supports includes moving the pipe length in a horizontal attitude from the array to a state of
support on a carriage movable along a path adjacent to and parallel to the array, the carriage
supporting the pipe length at spaced locations along the pipe length.

30 50. The method according to claim 49 including raising an end one of the locations of
carriage support of the pipe relative to the carriage upon movement of the carriage to a selected
place displaced from the array, the selected place being associated with removal of the pipe
length from the carriage.

35 51. The method according to claim 49 in which the carriage has two locations of
support of a pipe length disposed thereon, one of which is raisable relative to the carriage, the
other of which is movable along the carriage and is adapted to support an end of the pipe length.

1 52. A method for storing, handling, and moving drill pipe in association with a well
drilling rig having a drilling operations floor, the method comprising the operations of:
 lifting a stand of drill pipe directly from an individual horizontal storage position
in an array of stand storage positions,
5 placing the lifted stand on a carriage arranged to support the placed stand at spaced
locations along its length,
 moving the carriage towards the floor to place one end of the carriage at the floor,
 elevating the one end of the placed stand above its placed position on the carriage
as the carriage nears the floor, and
10 hoisting the stand via the one end thereof to a vertical position above the floor while
movably supporting the other end of the stand on the carriage.

15 53. The method according to claim 52 in which the elevating operation includes raising
the location of carriage support of the placed stand which is nearest the one end of the stand.